

GND A New Economic Initiative
Job Service North Dakota
North Dakota Board of Vocational & Technical Education
North Dakota Department of Commerce
North Dakota Governor's Office
North Dakota Information Technology Department
North Dakota University System
North Dakota Workforce Development Council

Final Report:

Information Technology Needs Assessment Study

Prepared by

WINKELMAN CONSULTING

P O B O X 11375 • F A R G O , N D 58106-1375

701-799-0877 • Cell/Voice Mail

701-237-6877 • Fax Machine

701-237-2283 • Office

M R W i n k e l m a n @ p r o d i g y . n e t

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Section

1

METHODOLOGY

Purpose

The purpose of this research study was to obtain information that will be used to enhance Information Technology (IT) education and training programs in North Dakota. This will enable organizations in our state to obtain the quality and quantity of IT workers they need now and/or in the future. To do this, the study focused on the following objectives:

- Assess employers' needs for qualified Information Technology (IT) workers.

- Determine qualifications needed and desired in Information Technology (IT) workers.

Collection Technique & Timing

A letter and survey were sent to one or more management staff within each organization: the CEO/owner, Human Resources Director, and/or IT Director. The letter asked respondents to participate by completing either a secure web survey or returning the enclosed mail survey. Data collection was conducted from November 2002 through February 2003.

Sampling Frame & Sample Size

The population for this study consisted of organizations that the steering committee (see Section 4) identified as "technology leaders" in the state of North Dakota. Nearly 400 organization names were provided by the study sponsors. After "cleaning" the list, a total of 331 organizations (784 contacts) remained.

A total of 236 surveys were returned by 196 organizations. Of these, 232 surveys from 192 organizations were useable. This provides an "organization" return rate of 59.2% and a completion rate of 58.0%.

Of the 232 surveys returned, 165 were returned online and 67 were returned by mail.

Weighting the Data

Since some organizations completed two or three surveys, the results were weighted so that each organization is represented only once in the data. For example, surveys from organizations that provided one response received a weight of 1.00, surveys from organizations that provided two responses received a weight of 0.50, and surveys from organizations that provided three responses received a weight of 0.34 (CEO), 0.33 (HR), and 0.33 (IT).

Margin of Error

The 192 participating organizations provide a 95% confidence level with an overall minimum and maximum margin of error of $\pm 2.7\%$ and $\pm 4.6\%$, respectively, in estimating the proportion of "IT Leaders" who possess a certain characteristic or opinion. In other words, if 100 samples (all of 192 in size) were drawn from this population, approximately 95 of the samples would have proportions within $\pm 2.7\%$ and $\pm 4.6\%$ of the proportions of the entire population for the characteristic or opinion being measured.

The margin of error explained previously only applies to responses of the *entire* sample. As shown in the next chart, the margin of error will be larger when looking at the responses of smaller segments.

Populations	Participating Organizations	Organizations Surveyed	Margin of Error for results at or about...				
			10%/90%	20%/80%	30%/70%	40%/60%	50%/50%
Total Sample	192	331	2.7%	3.7%	4.2%	4.5%	4.6%
General	175	302	2.9%	3.8%	4.4%	4.7%	4.8%
Sub-segments	150	259	3.1%	4.1%	4.8%	5.1%	5.2%
	125	215	3.4%	4.5%	5.2%	5.6%	5.7%
	100	172	3.8%	5.1%	5.8%	6.2%	6.4%
	75	129	4.4%	5.9%	6.7%	7.2%	7.3%
	50	86	5.4%	7.2%	8.2%	8.8%	9.0%
	40	69	6.0%	8.0%	9.2%	9.8%	10.0%
	30	52	7.0%	9.3%	10.6%	11.4%	11.6%
	20	34	8.5%	11.4%	13.0%	13.9%	14.2%
	10	17	12.0%	16.1%	18.4%	19.7%	20.1%

* The maximum margin of error is shown in the "50%/50%" column and the minimum margin of error is shown in the "10%/90%" column.

Section 2

EXECUTIVE SUMMARY

When reviewing this report, the findings and conclusions will be more thoroughly understood if several other sections of the report are also reviewed. First, the questionnaire in Section 4 provides the actual phrasing for each question. A solid understanding of the context in which each question was asked will enable you to more accurately interpret the findings. Second, the contingency tables in Section 5 provide detailed results for many different sample segments. Since the condensed nature of this summary report format does not allow us to address all of these findings, we strongly recommend that you review the contingency tables and use them to facilitate any major decisions you make.

Purpose #1: Assess employers' needs for qualified Information Technology (IT) workers.

- A minority of organizations said they have experienced difficulty getting the quantity and quality of Information Technology (IT) employees they need. However, a large majority of responding organizations said their use of technology will increase in the next 1 to 3 years and their need for employees with technology-related skills and ability will increase in the next 1 to 3 years. *This implies that demand for IT workers is likely to increase in the future. Thereby, creating a shortage if the quality and/or quantity of IT workers do not also increase in the future.*
- Future and current needs for IT workers are even stronger with those organizations that have more IT workers and/or a higher percentage of employees in IT positions.
- The 192 responding organizations...
 - Employ roughly 3,300 IT workers
 - Have more than 2,200 IT workers that need training to maintain their skills
 - Have nearly 2,200 IT workers that need training to improve their skills
 - Currently have about 150 openings for IT workers
 - Anticipate having more than 700 openings for IT workers in the next twelve months

*This suggests that the number of IT workers employed by these technology leaders could jump from 3,300 to roughly 4,150 (an increase of about 25%) **if** there is an adequate supply of qualified IT workers.*

Purpose #2: Determine qualifications needed and desired in Information Technology (IT) workers.

- Naturally, employers want the IT workers they hire to possess the "hard" or technical skills needed to perform their job. However, they also want IT workers to have the "soft" skills needed to function effectively in a work environment. For example, three of the top seven qualifications for Network Design and Administration are ability to work in a team environment, good oral communication, and ability to interface with public/customers.

This suggests that an education curriculum that teaches only "hard skills" will not give future IT workers all of the skills desired by potential employers.

Section 3

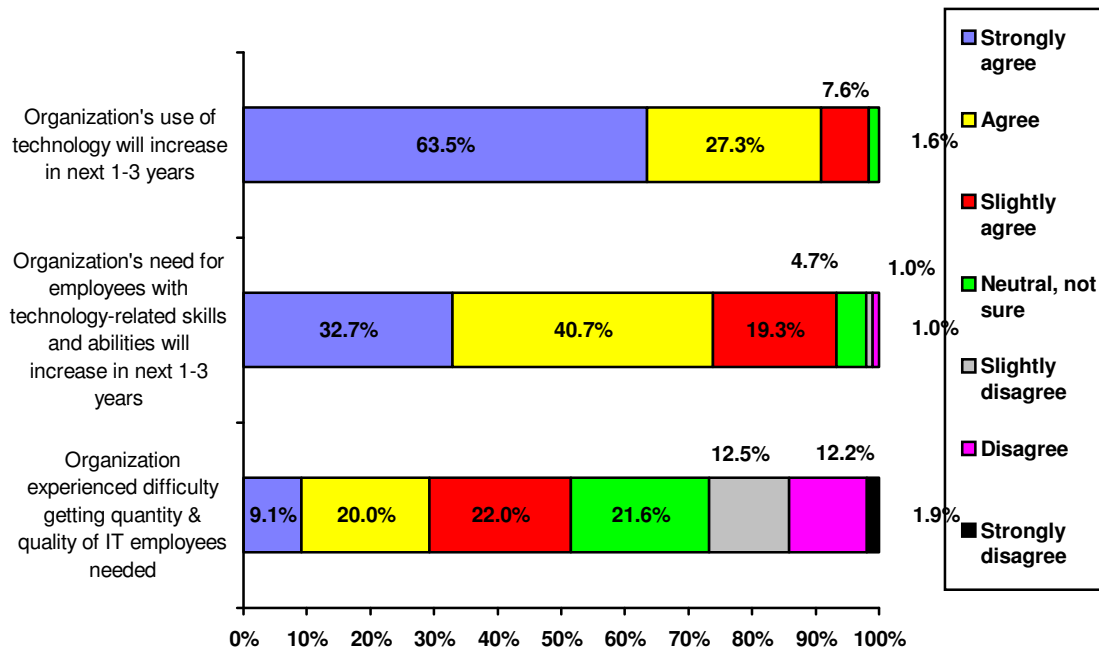
STUDY FINDINGS

Level of Agreement with Technology-Related Statements

- Organizational leaders were asked to indicate their level of agreement with several technology-related statements. *Figure 1a* shows that:
 - Nine of every ten either "strongly agree" or "agree" that their organization's use of technology will increase in the next 1 to 3 years.
 - Nearly three of every four either "strongly agree" or "agree" that their organization's need for employees with technology-related skills and ability will increase in the next 1 to 3 years.
 - Only about three of every ten either "strongly agree" or "agree" that their organization has experienced difficulty getting the quantity and quality of Information Technology (IT) employees they need.

This implies that demand for IT workers is likely to increase in the future. Thereby, creating a shortage if the quality and/or quantity of IT workers do not also increase in the future.

Figure 1a. How strongly do you agree or disagree with the following...
(Includes all respondents)



- The contingency tables in Section 5 provide the responses of various sample segments. As is summarized in *Chart A* below, the detail shows that a higher proportion of those with more IT workers and/or a higher percentage of employees in IT positions agreed with the technology-related statements.

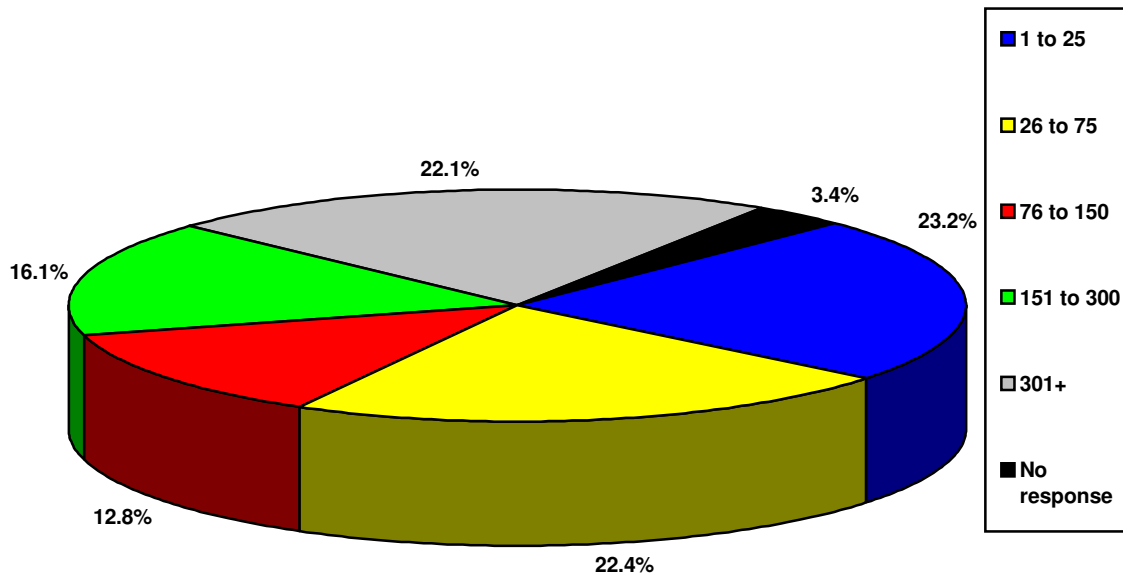
Chart A.

		Overall	Number of IT workers			Percent of employees in IT jobs		
			6 to 9	10 to 19	20+	6-20%	21-75%	76% +
In the next 1 to 3 years, our organization's use of technology will increase.	Strongly agree	63.5%	69.1%	69.0%	68.0%	64.9%	71.4%	72.1%
	Agree	27.3%	23.0%	20.7%	28.0%	23.0%	20.4%	23.3%
	Slightly agree	7.6%	7.9%	6.9%	4.0%	8.1%	0.0%	4.7%
	Total agree	98.4%	100.0%	96.6%	100.0%	96.0%	91.8%	100.1%
In the next 1 to 3 years, our organization's need for employees with technology-related skills and abilities will increase.	Strongly agree	32.7%	31.6%	43.1%	46.0%	34.5%	57.1%	51.2%
	Agree	40.7%	43.4%	39.7%	34.0%	35.8%	22.4%	30.2%
	Slightly agree	19.3%	21.1%	15.5%	12.0%	17.6%	12.2%	14.0%
	Total agree	92.7%	96.1%	98.3%	92.0%	87.9%	91.7%	95.4%
Our organization has experienced difficulty getting the quantity and quality of Information Technology or IT employees we need.	Strongly agree	9.1%	2.0%	10.3%	14.0%	0.0%	22.4%	9.3%
	Agree	20.0%	15.8%	31.0%	38.0%	24.3%	22.4%	32.6%
	Slightly agree	22.0%	27.6%	12.1%	32.0%	12.2%	26.5%	27.9%
	Total agree	51.1%	45.4%	53.4%	84.0%	36.5%	71.3%	69.8%
Responding Organizations		192	25	29	25	25	25	22

IT Workers Currently Employed

- While most North Dakota organizations have fewer than ten employees, the majority of the "IT leaders" surveyed reported having more than 25 employees (see *Figure 1b*). Based on the total employees reported by the responding organizations, the average (mean) is 303.29 and the midpoint (median) is 93.75 total employees.

Figure 1b. Total number of full-time workers.
(Includes all respondents)



- Despite the large number of employees reported by respondents, the majority of the "IT leaders" surveyed reported having 5 or fewer IT workers (see Figure 1c). For IT employees, the average (mean) is 17.30 and the midpoint (median) is 4.00 employees.
- Based on these reported employee numbers, we can calculate the percentage of all employees that have IT jobs. Figure 1d shows that more than six of every ten responding organizations reported that 5% or fewer of their total employees have IT jobs.

These findings suggest that, even among organizations perceived to be "IT leaders", IT workers are a minority of the organization's total workforce. In fact, only 16.7% of the responding organizations reported that 50% or more of their employees have IT jobs.

Figure 1c. Total number of IT workers.
(Includes all respondents)

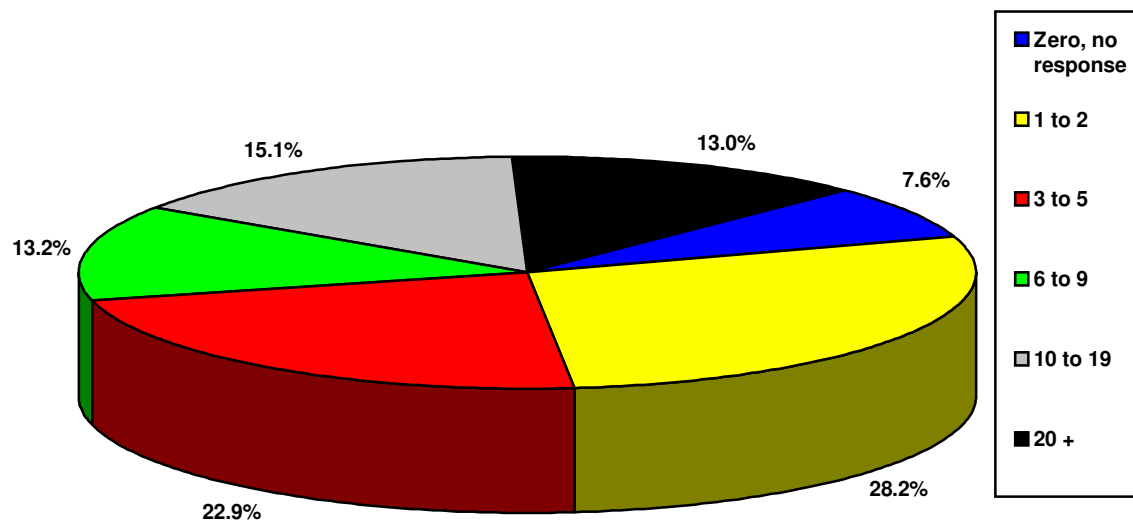


Figure 1d. Percentage of employees in IT jobs.
(Includes all respondents)

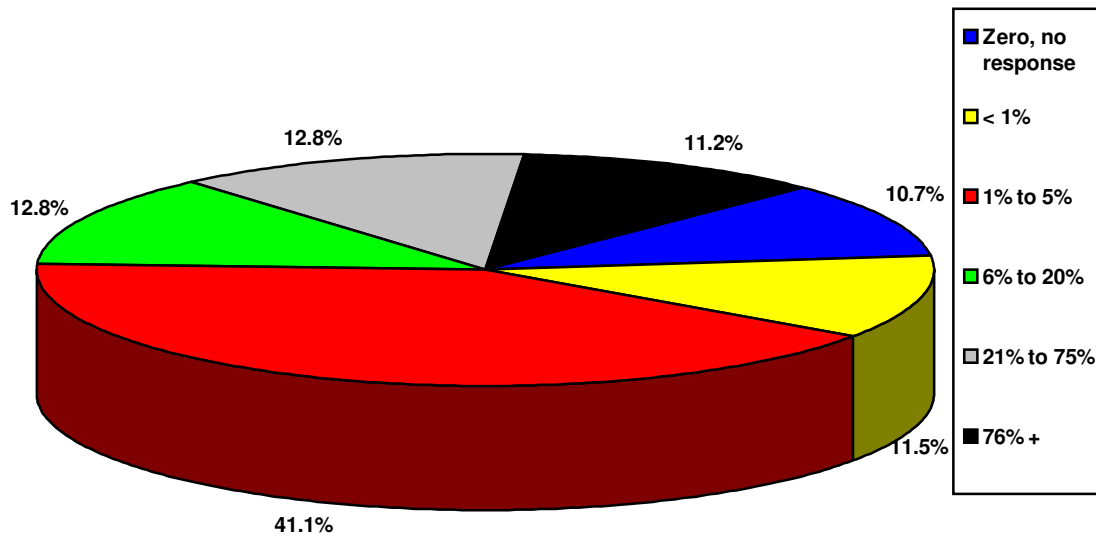
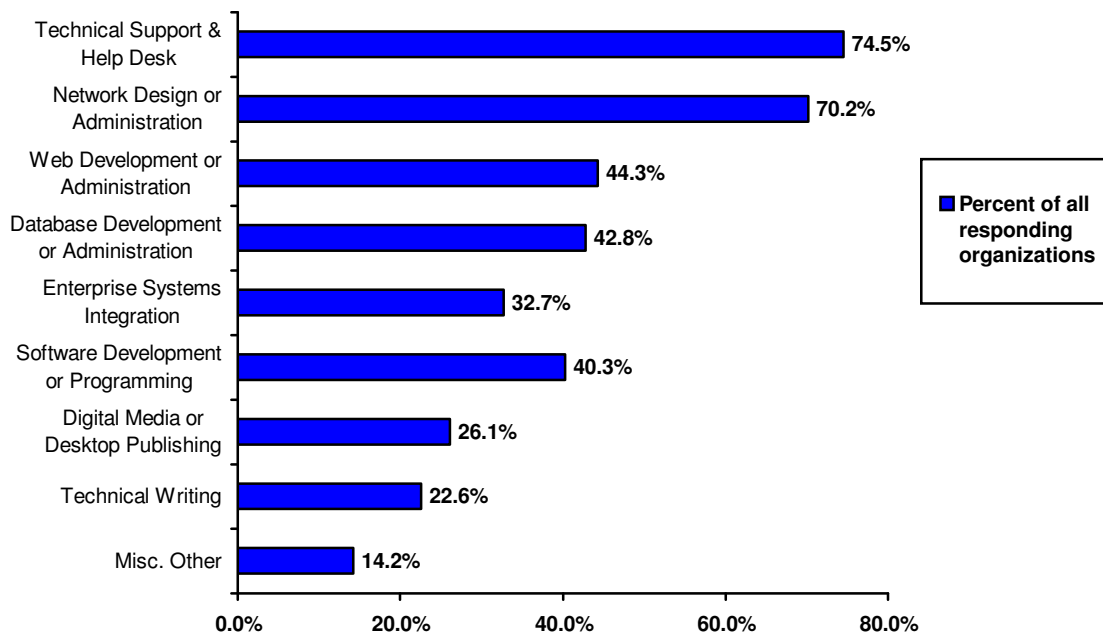


Figure 2a. In which job categories do you currently employ IT workers?
(Includes all respondents)

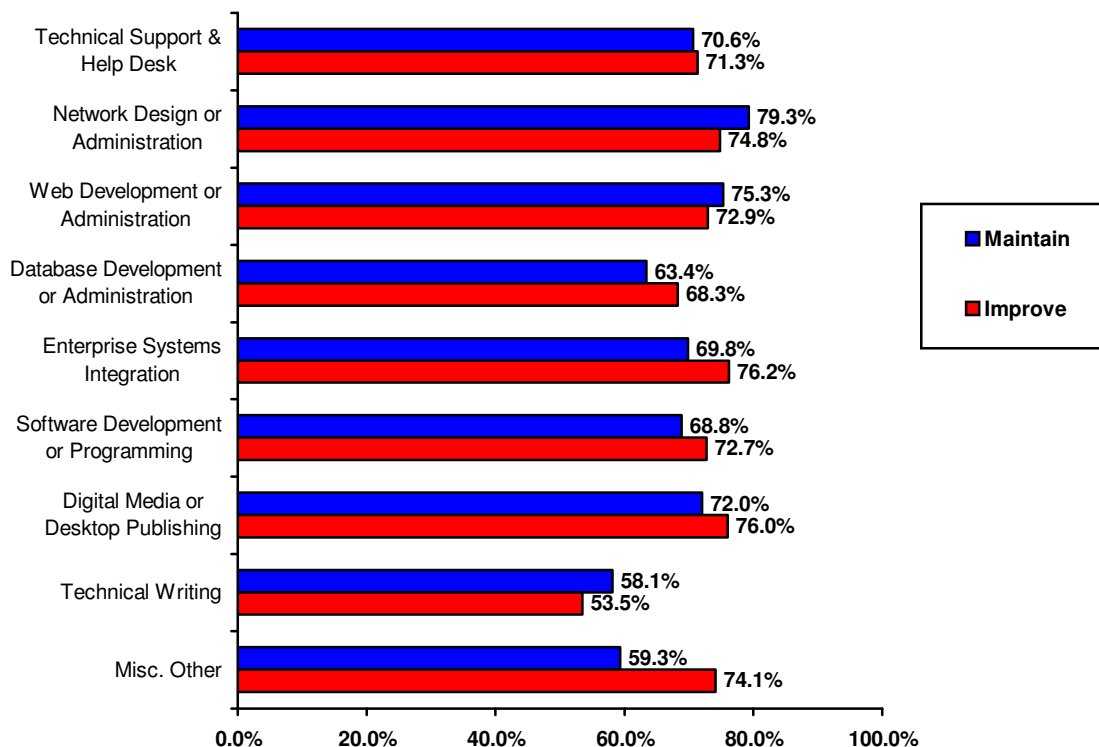


- Responding organizations were asked to indicate the types of IT workers employed by their organization. *Figure 2a* (on the previous page) shows that the largest share of responding organizations reported that they have IT workers in Technical Support or Help Desk job and Network Design or Administration.
- The first set of rows in Charts B1 to B10 (Pages 3-7 to 3-11) provide more detail related to the number of employees in each job category. As was noted earlier, the responses of those with more IT workers and/or a higher percentage of employees in IT positions tend to deviate slightly from those less entrenched in technology. Therefore, the charts also provide the results for those with 10 or more IT workers and those with 21% or more of their employees in IT positions. In most cases, those with more IT workers and/or a higher percentage of employees in IT positions are more likely to have employees (and have more employees) in each category.

Current IT Workers' Training Needs

- Organizations that indicated they have employees in a category were asked to indicate how many of these employees they feel need training to (1) maintain and/or (2) improve their skills. *Figure 2b* shows that a majority of responding organizations indicated that one or more of their employees in each category need training to maintain and/or improve their skills.

Figure 2b. Training needs for current IT workers?
(Includes all respondents)



- The second and third set of rows in Charts B1 to B10 (Pages 3-7 to 3-11) provide more detail related to the training needs of employees in each job category. For these questions, the responses of those with more IT workers and/or a higher percentage of employees in IT positions do not seem to deviate as greatly from those other respondents.

IT Workers Needed

- All respondents were asked to indicate how many openings they currently have posted and/or are likely to post in the next twelve months. *Figure 2c* shows that the largest proportion of responding organizations indicated they have one or more current and/or anticipated openings in Technical Support or Help Desk, Network Design or Administration, and Software Development or Programming.
- Again, the fourth and fifth set of rows in Charts B1 to B10 (Pages 3-7 to 3-11) provide more detail related to the current and anticipated openings for employees in each job category.

Figure 2c. Current and Anticipated Openings for IT workers?
(Includes all respondents)

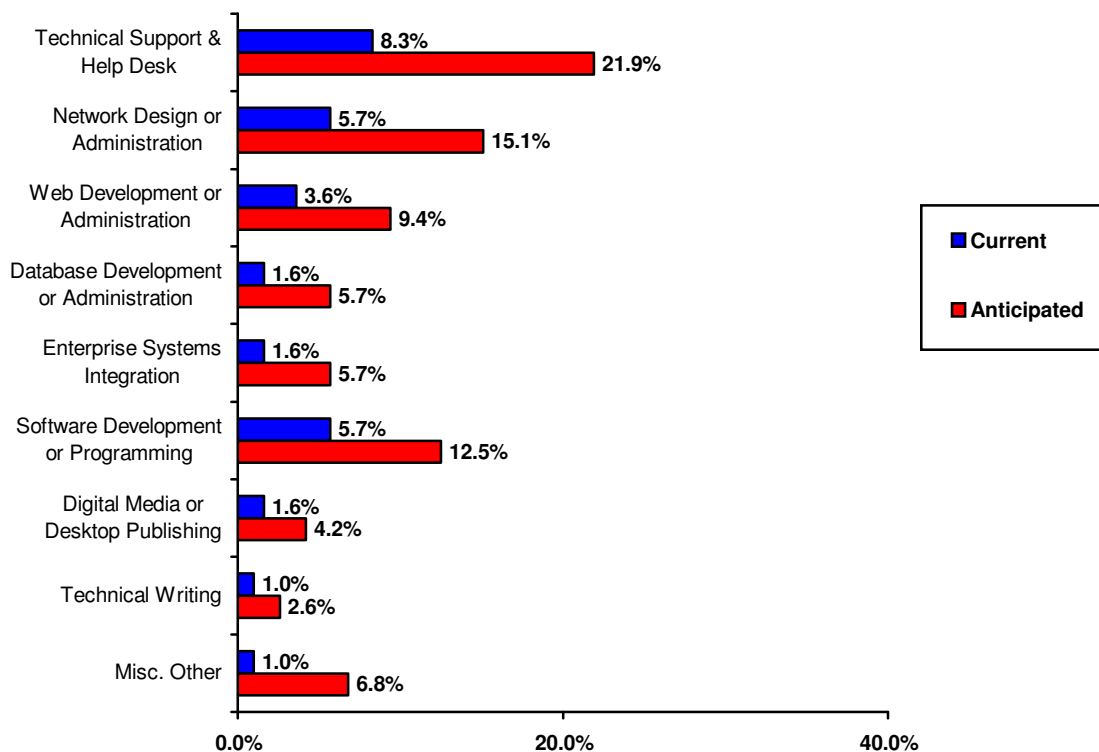


Chart B1. Section 2-Technical Support & Help Desk

		Overall	workers		employees in IT	
			10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q2a. Total employees with primary responsibilities in this job category.	Organizations (#)	143	27	22	19	17
	Organizations (%)	74.5%	93.1%	88.0%	76.0%	77.3%
	Employees	1,430	80	1,194	373	713
	Mean (Average)	10.00	3.01	54.26	19.65	43.19
	Median (Midpoint)	2.00	2.00	9.00	3.50	2.75
Q2b. Number of employees that need training to maintain skills.	Organizations (#)	101	15	18	10	11
	Organizations with IT workers in this category (%)	70.6%	55.6%	81.8%	52.6%	64.7%
	Employees	1,158	45	1,012	338	612
	Mean (Average)	11.50	3.01	56.19	33.83	55.63
	Median (Midpoint)	1.20	2.00	5.00	2.50	2.50
Q2c. Number of employees that need training to improve skills.	Organizations (#)	102	16	16	15	11
	Organizations with IT workers in this category (%)	71.3%	59.3%	72.7%	78.9%	64.7%
	Employees	1,103	50	947	240	665
	Mean (Average)	10.85	3.11	61.06	16.52	63.37
	Median (Midpoint)	1.10	2.00	7.75	3.00	2.25
Q2d. Number of openings currently posted.	Organizations (#)	16	2	8	3	4
	Organizations (%)	8.3%	6.9%	32.0%	12.0%	18.2%
	Employees	76	2	67	16	49
	Mean (Average)	4.87	1.00	8.38	5.33	12.25
	Median (Midpoint)	1.00	1.00	3.50	5.00	4.00
Q2e. Number of openings likely to post in next 12 months.	Organizations (#)	42	6	11	12	7
	Organizations (%)	21.9%	20.7%	44.0%	48.0%	31.8%
	Employees	495	7	448	30	430
	Mean (Average)	11.73	1.17	40.73	2.57	61.43
	Median (Midpoint)	1.00	1.00	1.00	1.00	1.00

Chart B2. Section 3-Network Design or Administration

		Overall	workers		employees in IT	
			10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q3a. Total employees with primary responsibilities in this job category.	Organizations (#)	135	24	25	18	19
	Organizations (%)	70.3%	82.8%	100.0%	72.0%	86.4%
	Employees	393	57	237	70	40
	Mean (Average)	2.91	2.37	9.47	3.91	2.17
	Median (Midpoint)	1.00	2.00	5.00	1.00	1.15
Q3b. Number of employees that need training to maintain skills.	Organizations (#)	107	17	22	12	12
	Organizations with IT workers in this category (%)	79.3%	70.8%	88.0%	66.7%	63.2%
	Employees	266	36	152	54	22
	Mean (Average)	2.49	2.18	6.90	4.73	1.91
	Median (Midpoint)	1.00	1.09	3.00	1.00	1.00
Q3c. Number of employees that need training to improve skills.	Organizations (#)	101	19	21	15	11
	Organizations with IT workers in this category (%)	74.8%	79.2%	84.0%	83.3%	57.9%
	Employees	241	41	130	47	21
	Mean (Average)	2.38	2.19	6.18	3.21	1.95
	Median (Midpoint)	1.00	1.84	3.00	1.00	1.05
Q3d. Number of openings currently posted.	Organizations (#)	11	1	8	2	3
	Organizations (%)	5.7%	3.4%	32.0%	8.0%	13.6%
	Employees	21	1	17	7	3
	Mean (Average)	2.00	1.00	2.27	3.50	1.00
	Median (Midpoint)	1.00	1.00	1.50	3.50	1.00
Q3e. Number of openings likely to post in next 12 months.	Organizations (#)	29	6	12	6	5
	Organizations (%)	15.1%	20.7%	48.0%	24.0%	22.7%
	Employees	38	7	20	7	7
	Mean (Average)	1.29	1.17	1.63	1.17	1.40
	Median (Midpoint)	1.00	1.00	1.00	1.00	1.00

Chart B3. Section 4-Web Development or Administration

Chart B3. Section 4-Web Development or Administration		Overall	workers		employees in IT	
			10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q4a. Total employees with primary responsibilities in this job category.	Organizations (#)	85	19	22	12	14
	Organizations (%)	44.3%	65.5%	88.0%	48.0%	63.6%
	Employees	166	28	101	33	36
	Mean (Average)	1.95	1.47	4.57	2.91	2.55
	Median (Midpoint)	1.00	1.00	3.00	2.00	1.00
Q4b. Number of employees that need training to maintain skills.	Organizations (#)	64	11	19	8	8
	Organizations with IT workers in this category (%)	75.3%	57.9%	86.4%	66.7%	57.1%
	Employees	99	13	55	25	14
	Mean (Average)	1.54	1.15	2.87	3.31	1.79
	Median (Midpoint)	1.00	1.00	2.00	1.75	1.00
Q4c. Number of employees that need training to improve skills.	Organizations (#)	62	11	19	9	11
	Organizations with IT workers in this category (%)	72.9%	57.9%	86.4%	75.0%	78.6%
	Employees	95	14	53	25	16
	Mean (Average)	1.52	1.30	2.86	2.79	1.52
	Median (Midpoint)	1.00	1.00	2.00	2.00	1.00
Q4d. Number of openings currently posted.	Organizations (#)	7	-	5	1	2
	Organizations (%)	3.6%	0.0%	20.0%	4.0%	9.1%
	Employees	11	-	8	1	2
	Mean (Average)	1.50	-	1.50	1.00	1.00
	Median (Midpoint)	1.50	-	1.50	1.00	1.00
Q4e. Number of openings likely to post in next 12 months.	Organizations (#)	18	3	5	6	1
	Organizations (%)	9.4%	10.3%	20.0%	24.0%	4.5%
	Employees	19	3	6	7	1
	Mean (Average)	1.08	1.00	1.33	1.18	1.00
	Median (Midpoint)	1.00	1.00	1.00	1.00	1.00

Chart B4. Section 5-Database Development or Administration.

Chart B4. Section 5-Database Development or Administration.		Overall	workers		employees in IT	
			10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q5a. Total employees with primary responsibilities in this job category.	Organizations (#)	82	19	20	12	12
	Organizations (%)	42.7%	65.5%	80.0%	48.0%	54.5%
	Employees	143	26	74	40	21
	Mean (Average)	1.74	1.42	3.78	3.34	1.86
	Median (Midpoint)	1.00	1.00	2.25	1.74	1.25
Q5b. Number of employees that need training to maintain skills.	Organizations (#)	52	12	15	5	5
	Organizations with IT workers in this category (%)	63.4%	63.2%	75.0%	41.7%	41.7%
	Employees	90	13	49	26	7
	Mean (Average)	1.73	1.16	3.27	5.67	1.40
	Median (Midpoint)	1.00	1.00	2.00	5.25	1.00
Q5c. Number of employees that need training to improve skills.	Organizations (#)	56	14	15	7	9
	Organizations with IT workers in this category (%)	68.3%	73.7%	75.0%	58.3%	75.0%
	Employees	94	17	52	23	16
	Mean (Average)	1.67	1.24	3.47	3.33	1.80
	Median (Midpoint)	1.00	1.00	2.00	2.00	1.00
Q5d. Number of openings currently posted.	Organizations (#)	3	-	1	-	1
	Organizations (%)	1.6%	0.0%	4.0%	0.0%	4.5%
	Employees	5	-	2	-	1
	Mean (Average)	1.67	-	3.00	-	1.00
	Median (Midpoint)	1.50	-	3.00	-	1.00
Q5e. Number of openings likely to post in next 12 months.	Organizations (#)	11	2	3	3	2
	Organizations (%)	5.7%	6.9%	12.0%	12.0%	9.1%
	Employees	15	2	7	4	4
	Mean (Average)	1.39	1.00	2.60	1.40	2.00
	Median (Midpoint)	1.00	1.00	2.75	1.25	2.00

Chart B5. Section 6-Enterprise Systems Integration

		Overall	workers		employees in IT	
			10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q6a. Total employees with primary responsibilities in this job category.	Organizations (#)	63	15	16	8	12
	Organizations (%)	32.8%	51.7%	64.0%	32.0%	54.5%
	Employees	138	31	77	32	27
	Mean (Average)	2.20	2.05	4.99	4.24	2.28
	Median (Midpoint)	1.00	2.00	3.00	2.00	1.00
Q6b. Number of employees that need training to maintain skills.	Organizations (#)	44	10	11	4	8
	Organizations with IT workers in this category (%)	69.8%	66.7%	68.8%	50.0%	66.7%
	Employees	80	16	39	19	9
	Mean (Average)	1.81	1.57	3.58	4.84	1.23
	Median (Midpoint)	1.00	1.00	2.00	2.00	1.00
Q6c. Number of employees that need training to improve skills.	Organizations (#)	48	12	11	6	11
	Organizations with IT workers in this category (%)	76.2%	80.0%	68.8%	75.0%	91.7%
	Employees	90	18	47	19	20
	Mean (Average)	1.86	1.58	4.31	3.39	1.90
	Median (Midpoint)	1.00	1.00	3.50	1.50	1.00
Q6d. Number of openings currently posted.	Organizations (#)	3	1	1	-	-
	Organizations (%)	1.6%	3.4%	4.0%	0.0%	0.0%
	Employees	4	1	1	-	-
	Mean (Average)	1.32	1.00	1.00	-	-
	Median (Midpoint)	1.00	1.00	1.00	-	-
Q6e. Number of openings likely to post in next 12 months.	Organizations (#)	11	5	5	2	2
	Organizations (%)	5.7%	17.2%	20.0%	8.0%	9.1%
	Employees	14	5	8	3	4
	Mean (Average)	1.26	1.00	1.67	1.67	2.00
	Median (Midpoint)	1.00	1.00	1.25	1.75	2.00

Chart B6. Section 7-Software Development or Programming

		Overall	workers		employees in IT	
			10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q7a. Total employees with primary responsibilities in this job category.	Organizations (#)	77	22	17	12	14
	Organizations (%)	40.1%	75.9%	68.0%	48.0%	63.6%
	Employees	700	79	570	312	127
	Mean (Average)	9.05	3.58	33.53	27.14	9.04
	Median (Midpoint)	2.00	2.30	11.00	3.75	2.00
Q7b. Number of employees that need training to maintain skills.	Organizations (#)	53	14	13	6	10
	Organizations with IT workers in this category (%)	68.8%	63.6%	76.5%	50.0%	71.4%
	Employees	407	31	343	266	24
	Mean (Average)	7.69	2.22	27.40	44.31	2.50
	Median (Midpoint)	1.00	1.00	6.75	1.00	2.00
Q7c. Number of employees that need training to improve skills.	Organizations (#)	56	17	12	7	12
	Organizations with IT workers in this category (%)	72.7%	77.3%	70.6%	58.3%	85.7%
	Employees	394	51	312	203	79
	Mean (Average)	7.00	3.09	27.09	29.05	6.86
	Median (Midpoint)	1.00	2.00	8.25	2.00	2.00
Q7d. Number of openings currently posted.	Organizations (#)	11	2	6	3	4
	Organizations (%)	5.7%	6.9%	24.0%	12.0%	18.2%
	Employees	23	2	17	8	4
	Mean (Average)	2.09	1.00	2.83	3.00	1.00
	Median (Midpoint)	1.00	1.00	2.00	2.25	1.00
Q7e. Number of openings likely to post in next 12 months.	Organizations (#)	24	7	8	6	5
	Organizations (%)	12.5%	24.1%	32.0%	24.0%	22.7%
	Employees	88	11	67	56	11
	Mean (Average)	3.74	1.50	8.87	10.09	2.10
	Median (Midpoint)	1.00	1.00	1.25	1.00	2.00

Chart B7. Section 8-Digital Media & Desktop Publishing

Chart B7. Section 8-Digital Media & Desktop Publishing		Overall	workers		employees in IT	
			10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q8a. Total employees with primary responsibilities in this job category.	Organizations (#)	50	11	10	7	6
	Organizations (%)	26.0%	37.9%	40.0%	28.0%	27.3%
	Employees	109	31	46	20	12
	Mean (Average)	2.17	2.91	4.63	2.83	2.04
	Median (Midpoint)	1.00	1.00	5.00	1.12	1.00
Q8b. Number of employees that need training to maintain skills.	Organizations (#)	36	7	8	4	4
	Organizations with IT workers in this category (%)	72.0%	63.6%	80.0%	57.1%	66.7%
	Employees	60	10	26	12	4
	Mean (Average)	1.67	1.40	3.45	3.38	1.26
	Median (Midpoint)	1.00	1.00	3.35	4.00	1.25
Q8c. Number of employees that need training to improve skills.	Organizations (#)	38	10	8	6	4
	Organizations with IT workers in this category (%)	76.0%	90.9%	80.0%	85.7%	66.7%
	Employees	59	11	24	13	4
	Mean (Average)	1.55	1.12	3.25	2.10	1.11
	Median (Midpoint)	1.00	1.00	2.85	1.12	1.00
Q8d. Number of openings currently posted.	Organizations (#)	3	1	1	-	-
	Organizations (%)	1.6%	3.4%	4.0%	0.0%	0.0%
	Employees	4	1	1	-	-
	Mean (Average)	1.40	1.00	1.00	-	-
	Median (Midpoint)	1.25	1.00	1.00	-	-
Q8e. Number of openings likely to post in next 12 months.	Organizations (#)	8	4	2	2	-
	Organizations (%)	4.2%	13.8%	8.0%	8.0%	0.0%
	Employees	11	5	3	3	-
	Mean (Average)	1.31	1.43	1.67	2.00	-
	Median (Midpoint)	1.00	1.25	1.75	2.00	-

Chart B8. Section 9-Technical Writing

Chart B8. Section 9-Technical Writing			workers		employees in IT	
		Overall	10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q9a. Total employees with primary responsibilities in this job category.	Organizations (#)	43	8	12	10	6
	Organizations (%)	22.4%	27.6%	48.0%	40.0%	27.3%
	Employees	78	13	43	23	12
	Mean (Average)	1.81	1.58	3.70	2.43	2.12
	Median (Midpoint)	1.00	1.11	2.00	1.03	2.00
Q9b. Number of employees that need training to maintain skills.	Organizations (#)	25	5	6	6	2
	Organizations with IT workers in this category (%)	58.1%	62.5%	50.0%	60.0%	33.3%
	Employees	38	5	17	17	2
	Mean (Average)	1.52	1.07	3.00	3.07	1.00
	Median (Midpoint)	1.00	1.00	1.00	1.00	1.00
Q9c. Number of employees that need training to improve skills.	Organizations (#)	23	5	5	6	2
	Organizations with IT workers in this category (%)	53.5%	62.5%	41.7%	60.0%	33.3%
	Employees	33	4	13	14	2
	Mean (Average)	1.40	0.86	2.78	2.33	1.00
	Median (Midpoint)	1.00	1.00	1.00	1.00	1.00
Q9d. Number of openings currently posted.	Organizations (#)	2	-	1	-	1
	Organizations (%)	1.0%	0.0%	4.0%	0.0%	4.5%
	Employees	3	-	1	-	1
	Mean (Average)	1.50	-	1.00	-	1.00
	Median (Midpoint)	1.50	-	1.00	-	1.00
Q9e. Number of openings likely to post in next 12 months.	Organizations (#)	5	1	2	3	1
	Organizations (%)	2.6%	3.4%	8.0%	12.0%	4.5%
	Employees	9	1	6	7	1
	Mean (Average)	1.80	1.00	3.00	2.33	1.00
	Median (Midpoint)	1.00	1.00	3.00	1.00	1.00

Chart B9. Section 10-Other

Chart B9. Section 10-Other			workers		employees in IT	
		Overall	10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q10a. Total employees with primary responsibilities in this job category.	Organizations (#)	27	7	10	4	4
	Organizations (%)	14.1%	24.1%	40.0%	16.0%	18.2%
	Employees	154	25	112	26	16
	Mean (Average)	5.67	3.85	11.79	7.43	4.00
	Median (Midpoint)	3.00	3.75	8.25	7.50	2.50
Q10b. Number of employees that need training to maintain skills.	Organizations (#)	16	5	6	4	2
	Organizations with IT workers in this category (%)	59.3%	71.4%	60.0%	100.0%	50.0%
	Employees	61	13	41	18	11
	Mean (Average)	3.75	2.60	7.45	5.14	5.50
	Median (Midpoint)	2.00	2.00	8.75	4.25	5.50
Q10c. Number of employees that need training to improve skills.	Organizations (#)	20	5	9	4	2
	Organizations with IT workers in this category (%)	74.1%	71.4%	90.0%	100.0%	50.0%
	Employees	66	13	46	19	11
	Mean (Average)	3.36	2.60	5.41	5.29	5.50
	Median (Midpoint)	2.00	2.00	3.75	4.50	5.50
Q10d. Number of openings currently posted.	Organizations (#)	2	-	2	1	-
	Organizations (%)	1.0%	0.0%	8.0%	4.0%	0.0%
	Employees	4	-	4	2	-
	Mean (Average)	1.85	-	2.00	2.00	-
	Median (Midpoint)	2.00	-	2.00	2.00	-
Q10e. Number of openings likely to post in next 12 months.	Organizations (#)	13	1	4	4	1
	Organizations (%)	6.8%	3.4%	16.0%	16.0%	4.5%
	Employees	28	1	18	16	2
	Mean (Average)	2.14	1.00	4.50	4.43	2.00
	Median (Midpoint)	1.00	1.00	2.00	1.00	2.00

Chart B10. All Job Categories

Chart B10, All Job Categories		Overall	Number of IT workers		Percent of employees in IT jobs	
			10 to 19	20+	21-75%	76% +
Responding Organizations		192	29	25	25	22
Q2a. Total employees with primary responsibilities in this job category.	Organizations (#)					
	Organizations (%)					
	Employees	3,311	370	2,454	929	1,004
	Mean (Average)	17.24	12.76	98.16	37.16	45.64
	Median (Midpoint)					
Q2b. Number of employees that need training to maintain skills.	Organizations (#)					
	Organizations with IT workers in this category (%)					
	Employees	2,259	182	1,734	775	705
	Mean (Average)	11.77	6.28	69.36	31.00	32.05
	Median (Midpoint)					
Q2c. Number of employees that need training to improve skills.	Organizations (#)					
	Organizations with IT workers in this category (%)					
	Employees	2,175	219	1,624	603	834
	Mean (Average)	11.33	7.55	64.96	24.12	37.91
	Median (Midpoint)					
Q2d. Number of openings currently posted.	Organizations (#)					
	Organizations (%)					
	Employees	151	7	118	34	60
	Mean (Average)	0.79	0.24	4.72	1.36	2.73
	Median (Midpoint)					
Q2e. Number of openings likely to post in next 12 months.	Organizations (#)					
	Organizations (%)					
	Employees	717	42	583	133	460
	Mean (Average)	3.73	1.45	23.32	5.32	20.91
	Median (Midpoint)					

Needed and Desired Qualifications

- For each job category in which a responding organization currently has IT workers, currently has openings, or is likely to have openings in the next twelve months, the respondent was asked to indicate the qualifications that are "needed" and "desired" by an employee. It is interesting to note the high proportion of respondents that indicate "soft skills" are needed or desired. For example, three of the top seven qualifications for Network Design and Administration are soft skills.
- **#1: Ability to work in team environment (45.3% + 5.5% = 50.8%)**
- #2: Bachelors degree (35.7% + 10.2% = 45.9%)
- #3: Analyze network needs & requirements (28.3% + 8.6% = 36.9%)
- #4: Monitor & manage network(s) (25.1% + 10.8% = 35.9%)
- **#5: Good oral communication (28.6% + 4.8% = 33.4%)**
- #6: Associates degree (30.4% + 2.4% = 32.8%)
- **#7: Ability to interface with public/customers (27.6% + 5.1% = 32.7%)**

Again, Charts C1-9 summarize the overall results, as well as the responses of those with more IT workers and/or a higher percentage of employees in IT positions. Please refer to these tables for more detail. Please note that for most items, three percentages are presented. The first indicates the percentage of responding organizations that named the item as a "needed" qualification, the second indicates the percentage that named it as a "desired" qualification, and the third is the sum of the two previous percentages.

For each of these questions, respondents were allowed to list up to ten "needed" qualifications and another ten "desired" qualifications. Therefore, the results will exceed 100% when the percentages are added together.

Chart C1. Needed and desired qualifications for Technical Support & Help Desk.

Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> Ability to work in a team environment (52.7% + 5.9% = 58.6%) Good oral communication skills (42.4% + 6.5% = 48.9%) Install software and upgrades (37.8% + 8.3% = 46.1%) Associates degree (40.2% + 3.7% = 43.9%) Ability to interface with public/customers (36.7% + 6.3% = 43.0%) Bachelors degree (26% + 10.3% = 36.3%) Ability to train others (26.8% + 6.1% = 32.9%) Knowledge of/background in business common practices (25.6% + 7.2% = 32.8%) Install/upgrade computer peripherals (26.2% + 5.4% = 31.6%) Good written communication skills (24.8% + 6.5% = 31.3%) Install, maintain, repair, upgrade computer components (21.1% + 5.8% = 26.9%) Phone, email support for customers with hardware problems (20.5% + 5.2% = 25.7%) Personal support for customers with software problems (20.4% + 5.2% = 25.6%) Diagnose hardware problems (18.2% + 7.2% = 25.4%) Phone, email support for customers with software problems (17.7% + 1.7% = 19.4%) Email network administration (15.5% + 3.7% = 19.2%) Install/upgrade network components (13.4% + 4.5% = 17.9%) High school diploma (16.7% + 1.0% = 17.7%) 	<ul style="list-style-type: none"> Ability to work in a team environment (66% + 3.8% = 69.8%) Ability to interface with public/customers (52.8% + 3.8% = 56.6%) Install software and upgrades (45.3% + 11.3% = 56.6%) Associates degree (47.2%) Good oral communication skills (43.4% + 3.8% = 47.2%) Knowledge of/background in business common practices (37.7% + 3.8% = 41.5%) Bachelor's degree (28.3% + 11.3% = 39.6%) Install, maintain, repair, upgrade computer components (30.2% + 7.5% = 37.7%) Install/upgrade computer peripherals (26.4% + 7.5% = 33.9%) Ability to train others (26.4%) Install/upgrade network components (26.4% + 3.8% = 30.2%) Personal support for customers with software problems (18.9% + 11.3% = 30.2%) Phone, email support for customers with software problems (20.8% + 1.9% = 22.7%) Microsoft Windows 2000 (11.3% + 11.3% = 22.6%) Good written communication skills (15.1% + 3.8% = 18.9%) Diagnose hardware problems (15.1% + 3.8% = 18.9%) A+ Certification (11.3% + 7.5% = 18.8%) Phone, email support for customers with hardware problems (11.3% + 5.7% = 17.0%) High school diploma (11.3%) 	<ul style="list-style-type: none"> Ability to work in a team environment (59.1% + 4.5% = 63.6%) Associates degree (50% + 9.1% = 59.1%) Ability to interface with public/customers (50% + 4.5% = 54.5%) Good oral communication skills (50% + 4.5% = 54.5%) Bachelors degree (20.5% + 27.3% = 47.8%) Install software and upgrades (36.4% + 11.4% = 47.8%) Personal support for customers with software problems (36.4% + 4.5% = 40.9%) Good written communication skills (31.8% + 4.5% = 36.3%) Diagnose hardware problems (25% + 9.1% = 34.1%) Ability to train others (15.9% + 13.6% = 29.5%) Knowledge of/background in business common practices (25.0% + 4.5% = 29.5%) Personal support for customers experiencing hardware problem (15.9% + 9.1% = 25.0%) Phone, email support for customers with software problems (25%) Install/upgrade computer peripherals (20.5% + 2.3% = 22.8%) Phone, email support for customers with hardware problems (22.7%) High school diploma (22.7%) Install, maintain, repair, upgrade computer components (15.9% + 6.8% = 22.7%) Email network administration (13.6% + 4.5% = 18.1%) HTML (11.4%) Microsoft Access (11.4%) SQL (Standard Query Language) (11.4%) 	<ul style="list-style-type: none"> Ability to work in a team environment (47.4% + 7.9% = 55.3%) Ability to interface with public/customers (47.4% + 5.3% = 52.7%) Good oral communication skills (36.8% + 13.2% = 50.0%) Associates Degree (47.4%) Phone, email support for customers with hardware problems (26.3% + 13.2% = 39.5%) Phone, email support for customers with software problems (31.6% + 5.3% = 36.9%) Knowledge of/background in business common practices (36.8%) Install software and upgrades (26.3% + 10.5% = 36.8%) Bachelors Degree (15.8% + 15.8% = 31.6%) Technical Support (21.1% + 10.5% = 31.6%) Ability to train others (21.1% + 5.3% = 26.4%) Cisco CCNA (15.8% + 7.9% = 23.7%) MCSE Certified (10.5% + 13.2% = 23.7%) Personal support for customers software problems (15.8% + 5.3% = 21.1%) High School diploma (18.4%) Good written communication skills (15.8%) SQL (Standard Query Language) (10.5% + 5.3% = 15.8%) Microsoft SQL Server software (10.5% + 5.3% = 15.8%) Network+ Certification (10.5% + 2.6% = 13.1%) Email network administration (10.5%) Install/upgrade computer peripherals (10.5%) 	<ul style="list-style-type: none"> Good oral communication skills (60.6% + 9.1% = 69.7%) Ability to interface with public/customers (60.6% + 9.1% = 69.7%) Ability to work in a team environment (57.6% + 3.0% = 60.6%) Associates Degree (42.4% + 15.2% = 57.6%) Good written communication skills (36.4% + 9.1% = 45.5%) Knowledge of/background in business common practices (15.2% + 15.2% = 30.4%) Ability to train others (27.3% + 3.0% = 30.3%) Install software and upgrades (27.3% + 3.0% = 30.3%) Personal support for customers with software problems (24.2% + 6.1% = 30.3%) Bachelors Degree (12.1% + 12.1% = 24.2%) Phone, email support for customers with hardware problems (24.2%) Install/upgrade network components (21.2%) Analyze network needs & requirements (18.2%) High School diploma (15.2% + 3.0% = 18.2%) Install/upgrade computer peripherals (15.2% + 3.0% = 18.2%) Microsoft Windows 2000 (12.1% + 6.1% = 18.2%) Develop systems, solutions & applications (12.1% + 6.1% = 18.2%) Email network administration (12.1%) Phone, email support for customers with software problems (12.1%)

Chart C1. Needed and desired qualifications for Technical Support & Help Desk.				
Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> • Microsoft Windows 2000 (11.6% + 5.2% = 16.8%) • Personal support for customers experiencing hardware problem (11.4% + 5.2% = 16.6%) 			<ul style="list-style-type: none"> • Install, maintain, repair, upgrade computer components (10.5%) • Microsoft SQL Server hardware (10.5%) 	

Chart C2. Needed and desired qualifications for Network Design or Administration.

Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> • Ability to work in team environment (45.3% + 5.5% = 50.8%) • Bachelors degree (35.7% + 10.2% = 45.9%) • Analyze network needs & requirements (28.3% + 8.6% = 36.9%) • Monitor & manage network(s) (25.1% + 10.8% = 35.9%) • Good oral communication (28.6% + 4.8% = 33.4%) • Associates degree (30.4% + 2.4% = 32.8%) • Ability to interface with public/customers (27.6% + 5.1% = 32.7%) • Install/upgrade network components (25.3% + 6.8% = 32.1%) • Install software and upgrades (22.3% + 5.5% = 27.8%) • Configure, implement & test network(s) (20.6% + 6.2% = 26.8%) • Email network administration (19.6% + 6.6% = 26.2%) • Good written communication (23.3% + 2.6% = 25.9%) • Design network(s) (16.9% + 9.0% = 25.9%) • Knowledge of/background in business common practices (21.3% + 4.4% = 25.7%) • Install, maintain, repair, upgrade computer components (15.6% + 6.6% = 22.2%) • Install/upgrade computer peripherals (13.2% + 4.8% = 18.0%) • Ability train others (17.2% + 0.7% = 17.9%) • Diagnose hardware problems (13.5% + 4.0% = 17.5%) • Microsoft Windows 2000 (10.2% + 3.3% = 13.5%) 	<ul style="list-style-type: none"> • Ability to work in team environment (58.3% + 12.5% = 70.8%) • Bachelors degree (43.8% + 8.3% = 52.1%) • Monitor & manage network(s) (37.5% + 14.6% = 52.1%) • Ability to interface with public/customers (39.6% + 8.3% = 47.9%) • Analyze network needs & requirements (39.6% + 8.3% = 47.9%) • Associates degree (39.6%) • Good oral communication (29.2% + 8.3% = 37.5%) • Install/upgrade network components (29.2% + 4.2% = 33.4%) • Configure, implement & test network(s) (29.2% + 4.2% = 33.4%) • Design network(s) (16.7% + 12.5% = 29.2%) • Email network administration (22.9% + 4.2% = 27.1%) • Knowledge of/background in business common practices (22.9% + 4.2% = 27.1%) • Install software and upgrades (25.0%) • Good written communication (20.8% + 4.2% = 25.0%) • MCSE Certified (18.8% + 4.2% = 23.0%) • Novell Certification (14.6% + 4.2% = 18.8%) • A+ Certification (16.7%) • Ability train others (16.7%) • Java (JavaScript) (12.5% + 4.2% = 16.7%) • Microsoft Windows 2000 (12.5%) • Knowledge of /background in math and sciences (10.4%) 	<ul style="list-style-type: none"> • Bachelors degree (30.0% + 24.0% = 54.0%) • Ability to work in team environment (50.0%) • Good oral communication (34.0% + 8.0% = 42.0%) • Associates degree (34.0% + 4.0% = 38.0%) • Monitor & manage network(s) (24.0% + 8.0% = 32.0%) • Install/upgrade network components (22.0% + 10.0% = 32.0%) • Install software and upgrades (28.0% + 2.0% = 30.0%) • Ability to interface with public/customers (26.0% + 4.0% = 30.0%) • Good written communication (24.0% + 4.0% = 28.0%) • Analyze network needs & requirements (20.0% + 8.0% = 28.0%) • Install, maintain, repair, upgrade computer components (20.0% + 6.0% = 26.0%) • Install/upgrade computer peripherals (16.0% + 10.0% = 26.0%) • Design network(s) (14.0% + 12.0% = 26.0%) • Diagnose hardware problems (18.0% + 4.0% = 22.0%) • Email network administration (14.0% + 6.0% = 20.0%) • High school diploma (16.0%) • Phone, email support for customers with hardware problems (12.0%) • Phone, email support for customers with software problems (12.0%) • Java (JavaScript) (10.0%) • Configure, implement & test database(s) & applications (10.0%) • Web site analysis OR 	<ul style="list-style-type: none"> • Ability to work in a team environment (36.1% + 16.7% = 52.8%) • Associates Degree (44.4%) • Bachelors Degree (27.8% + 11.1% = 38.9%) • MCSE Certified (38.9%) • Configure, implement & test network(s) (27.8% + 5.6% = 33.4%) • Email network (25.0% + 5.6% = 30.6%) • Monitor & manage network(s) (19.4% + 11.1% = 30.5%) • Analyze network needs & requirements (30.6%) • Good oral communication skills (11.1% + 16.7 = 27.8), 8%) • Install software and upgrades (22.2% + 5.6% = 27.8%) • Ability to interface with public/customers (25.0%) • Install, maintain, repair, upgrade computer components (16.75% + 5.6% = 22.35%) • Knowledge of/background in business common practices (13.9% + 5.6% = 19.5%) • Install/upgrade network components (11.1% + 8.3% = 19.4%) • Good written communication skills (16.7%) • Network+ Certification (11.1% + 5.6% = 16.7%) • Novell Certification (11.1% + 5.6% = 16.7%) • Technical Support (11.1% + 5.6% = 16.7%) • Design network(s) (11.1% + 5.6% = 16.7%) • Cisco CCNA (11.0% + 5.6% = 16.6%) • A+ Certification (11.1%) 	<ul style="list-style-type: none"> • Good oral communication (54.1% + 5.4% = 59.5%) • Ability to interface with public/customers (37.8% + 5.4% = 43.2%) • Install software and upgrades (35.1% + 8.1% = 43.2%) • Install/upgrade network components (43.2%) • Design network(s) (27.0% + 16.2% = 43.2%) • Good written communication (35.1% + 5.4% = 40.5%) • Email network administration (35.1% + 5.4% = 40.5%) • Analyze network needs & requirements (29.7% + 10.8% = 40.5%) • Ability to work in a team environment (37.8%) • Install/upgrade computer peripherals (29.7% + 2.7% = 32.4%) • Bachelors Degree (27.0% + 5.4% = 32.4%) • Associates Degree (21.6% + 10.8% = 32.4%) • Diagnose hardware problems (21.6% + 10.8% = 32.4%) • Cisco CCNA (10.8% + 21.6% = 32.4%) • Install, maintain, repair, upgrade computer components (21.6% + 5.4% = 27.0%) • Phone, email support for customers with hardware problems (18.9% + 2.7% = 21.6%) • Phone, email support for customers with software problems (18.9% + 2.7% = 21.6%) • Microsoft Windows 2000 (16.2% + 5.4% = 21.6%) • Linux (16.2% + 5.4% = 21.6%) • Monitor & manage network(s) (13.3% + 21.6% = 34.9%) • High school diploma (16.2%) • CISCO (Routers) (16.2%) • Configure, implement & test network(s) (16.2%) • C/C++ (13.5%) • A+ Certification (10.8%)

Chart C2. Needed and desired qualifications for Network Design or Administration.				
Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21 %-75%	76%
		ESI high-end tech support (10.0%)		

Chart C3. Needed and desired qualifications for Web Development or Administration.

Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> Bachelors degree (38.5% + 13.6% = 52.1%) Ability to work in team environment (48.5% + 2.8% = 51.3%) Configure, implement & test web site(s) & applications (25.6% + 12.7% = 38.3%) Web site analysis OR ESI high-end tech support (31.8% + 4.8% = 36.6%) Design web site(s) & application (26.8% + 8.3% = 35.1%) Update/maintain web site(s) & applications (26.8% + 7.2% = 34.0%) Manage web site applications (24.0% + 9.9% = 33.9%) Good oral communication (27.9% + 3.9% = 31.8%) HTML (22.3% + 8.6% = 30.9%) Good written communication (27.3% + 3.3% = 30.6%) Associates degree (25.5% + 1.1% = 26.6%) Monitor & manage network(s) (25.1%) Ability to interface with public/customers (20.6% + 4.4% = 25.0%) JAVA (JavaScript) (17.1% + 4.8% = 21.9%) XML (11.2% + 9.9% = 21.1%) Configure, implement & test network(s) (20.6%) Knowledge of/background in business common practices (12.8% + 6.6% = 19.4%) Analyze network needs & requirements (28.3% + 1.1% = 19.4%) Install software and upgrades (12.8% + 5.0% = 17.8%) Design network(s) (16.9%) Ability train others (13.4% + 1.1% = 	<ul style="list-style-type: none"> Good oral communication (44.7% + 10.5% = 55.2%) Bachelors degree (39.5% + 10.5% = 50.0%) Ability to interface with public/customers (34.2% + 10.5% = 44.7%) HTML (21.1% + 21.1% = 42.2%) Ability to work in team environment (42.1%) Configure, implement & test web site(s) & applications (28.9% + 10.5% = 39.4%) Design web site(s) & application (31.6% + 5.3% = 36.9%) Associates degree (31.6%) XML (10.5% + 21.1% = 31.6%) Manage web site applications (28.9%) JAVA (JavaScript) (15.8% + 10.5% = 26.3%) Good written communication (18.4% + 5.3% = 23.7%) Update/maintain web site(s) & applications (23.7%) Install/upgrade computer peripherals (21.1%) Microsoft SQL Server (15.8% + 5.3% = 21.1%) Microsoft Windows 2000 (10.5% + 10.5% = 21.0%) Diagnose hardware problems (10.5% + 5.3% = 15.8%) Active Server Pages (10.5% + 5.3% = 15.8%) Web site analysis OR ESI high-end tech support (18.4%) Ability train others (10.5%) Install software and upgrades (10.5%) 	<ul style="list-style-type: none"> Bachelors degree (45.5% + 27.3% = 72.8%) Manage web site applications (31.8% + 27.3% = 59.1%) Web site analysis OR ESI high-end tech support (47.7% + 9.1% = 56.8%) Ability to work in team environment (47.7% + 4.5% = 52.2%) Update/maintain web site(s) & applications (36.4% + 13.6% = 50.0%) Configure, implement & test web site(s) & applications (27.3% + 22.7% = 50.0%) Design web site(s) & application (34.1% + 13.6% = 47.7%) Good written communication (36.4% + 9.1% = 45.5%) HTML (34.1%) XML (20.5% + 6.8% = 27.3%) Good oral communication (22.7% + 4.5% = 27.2%) JAVA (JavaScript) (22.7% + 4.5% = 27.2%) Associates degree (25.0%) Ability to interface with public/customers (18.2% + 4.5% = 22.7%) SQL (Standard Query Language) (18.2% + 4.5% = 22.7%) Visual Basic (15.9% + 4.5% = 20.4%) Design database(s) & applications (11.4%) 	<ul style="list-style-type: none"> Bachelors degree (48.0% + 16.0% = 64.0%) Ability to work in team environment (52.0%) Configure, implement & test web site(s) & applications (20.0% + 32.0% = 52.0%) Design web site(s) & application (40.0% + 8.0% = 48.0%) Manage web site applications (20.0% + 24.0% = 44.0%) Web site analysis OR ESI high-end tech support (28.0% + 8.0% = 36.0%) Update/maintain web site(s) & applications (36.0%) Good oral communication (32.0%) Install software and upgrades (24.0%) Associates degree (24.0%) Ability train others (20.0%) Ability to interface with public/customers (20.0%) Good written communication (20.0%) Email Network administration (12.0% + 8.0% = 20.0%) JAVA (JavaScript) (20.0%) HTML (16.6%) Visual Basic (16.0%) C/C++ (12.0%) SQL (Standard Query Language) (12.0%) 	<ul style="list-style-type: none"> Ability to work in team environment (50.0%) Good written communication (39.3% + 7.1% = 46.4%) Bachelors degree (28.6% + 14.3% = 42.9%) Ability to interface with public/customers (35.7% + 7.1% = 42.8%) Good oral communication (35.7% + 7.1% = 42.8%) Design web site(s) & application (25.0% + 14.3% = 39.3%) HTML (32.1% + 7.1% = 39.2%) Manage web site applications (35.7%) Knowledge of/background in business common practices (28.6% + 7.1% = 35.7%) Configure, implement & test web site(s) & applications (17.9% + 14.3% = 32.2%) XML (32.1%) Active Server Pages (21.4% + 7.1% = 28.5%) Install software and upgrades (14.3% + 7.1% = 21.4%) Diagnose hardware problems (14.3% + 7.1% = 21.4%) Phone, email support for customers with hardware problems (14.3% + 7.1% = 21.4%) Microsoft SQL Server (14.3% + 3.6% = 17.9%) JAVA (JavaScript) (17.9%) Develop systems, solutions & applications (14.3%) Web site analysis OR ESI high-end tech support (14.3%) Associates degree (14.3%) Ability train others (14.3%) Install /upgrade network

Chart C3. Needed and desired qualifications for Web Development or Administration.				
Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
14.5%) • Install/upgrade computer peripherals (10.6% + 3.9% = 14.5%) • SQL (Standard Query Language) (11.2% + 1.1% = 12.3%)				components (14.3%) • Update/maintain web site(s) & applications (10.7%)

Chart C4. Needed and desired qualifications for Database Development or Administration.

Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> Bachelors degree (44.2% + 8.3% = 52.5%) Analyze database needs and requirements (39.2% + 8.3% = 47.5%) Ability to work in team environment (38.6% + 4.7% = 43.3%) Configure implement & test database(s) & applications (32.2% + 10.7% = 42.9%) Monitor & manage database(s) & applications (31.6% + 9.5% = 41.1%) Design database(s) & applications (31.0% + 7.7% = 38.7%) Good written communication (24.6% + 3.0% = 27.6%) SQL (Standard Query Language) (18.1% + 7.7% = 25.8%) Good oral communication (23.4%) Associates degree (19.9% + 3.0% = 22.9%) Knowledge of/background in business common practices (15.0% + 4.7% = 19.7%) Ability to interface with public/customers (14.6% + 3.0% = 17.6%) Microsoft Access (12.3% + 4.1% = 16.4%) Microsoft SQL Server (11.1% + 5.3% = 16.4%) Ability train others (14.4% + 1.2% = 15.6%) Install software and upgrades (10.3% + 4.7% = 15.0%) 	<ul style="list-style-type: none"> Configure implement & test database(s) & applications (43.2% + 8.1% = 51.3%) Ability to work in team environment (45.9% + 5.4% = 51.3%) Bachelors degree (43.2% + 5.4% = 48.6%) Design database(s) & applications (40.5% + 5.4% = 45.9%) Analyze database needs and requirements (35.1% + 5.4% = 40.5%) Monitor & manage database(s) & applications (32.4% + 8.1% = 40.5%) Knowledge of/background in business common practices (15.0% + 10.8% = 25.8%) Associates degree (24.3%) Ability train others (24.3%) Good written communication (24.3%) Good oral communication (24.3%) Ability to interface with public/customers (21.6%) Microsoft Access (10.8% + 10.8% = 21.6%) Perl (10.8% + 5.4% = 16.2%) Oracle (10.8% + 5.4% = 16.2%) Microsoft SQL Server (10.8% + 5.4% = 16.2%) SQL (Standard Query Language) (10.8% + 5.4% = 16.2%) Unix (10.8% + 5.4% = 16.2%) Install software and upgrades (10.3% + 5.4% = 15.7%) Novell (10.8%) 	<ul style="list-style-type: none"> Bachelors degree (53.8% + 25.6% = 79.4%) Analyze database needs and requirements (53.8% + 10.3% = 64.1%) Monitor & manage database(s) & applications (30.8% + 20.5% = 51.3%) Ability to work in team environment (38.5% + 5.1% = 43.6%) Configure implement & test database(s) & applications (33.3% + 10.3% = 43.6%) Good written communication (35.9%) Design database(s) & applications (25.6% + 10.3% = 35.9%) SQL (Standard Query Language) (28.2% + 5.1% = 33.3%) Good oral communication (28.2%) Microsoft Access (23.1%) Associates degree (20.5%) Ability to interface with public/customers (15.4% + 2.6% = 18.0%) Microsoft SQL Server (Hardware) (15.4% + 2.6% = 18.0%) Install software and upgrades (10.8%) C/C++ (10.3%) HTML (10.3%) Microsoft Excel (10.3%) Microsoft NT (10.3% + 2.6% = 12.9%) Microsoft SQL Server (Software) (10.3% + 5.1% = 15.4%) Microsoft Word (10.3% + 5.1% = 15.4%) Visual Basic (10.3%) 	<ul style="list-style-type: none"> Bachelors degree (45.8% + 8.3% = 54.1%) Ability to work in team environment (37.5%) Analyze database needs and requirements (29.2% + 8.3% = 37.5%) Monitor & manage database(s) & applications (16.7% + 20.8% = 37.5%) Associates degree (33.3%) Good written communication (29.2%) HTML (29.2%) Design database(s) & applications (12.5% + 16.7% = 29.2%) Good oral communication (25.0%) Email network administration (16.7% + 8.3% = 25.0%) C/C++ (16.7% + 4.2% = 20.9%) SQL (Standard Query Language) (16.7% + 4.2% = 20.9%) XML (12.5% + 8.3% = 20.8%) Ability train others (20.8%) Ability to interface with public/customers (20.8%) Microsoft Access (16.7%) Knowledge of/background in business common practices (12.5%) Java (JavaScript) (12.5%) Install software and upgrades (10.3%) 	<ul style="list-style-type: none"> Good written communication (52.2%) Good oral communication (43.5%) Bachelors degree (34.8% + 8.7% = 43.5%) Ability to work in team environment (43.5%) Design database(s) & applications (43.5%) Analyze database needs and requirements (34.8% + 8.7% = 43.5%) Configure implement & test database(s) & applications (34.8% + 8.7% = 43.5%) Microsoft SQL Server (Hardware) (26.1% + 8.7% = 34.8%) SQL (Standard Query Language) (26.1% + 8.7% = 34.8%) Ability to interface with public/customers (26.1%) Knowledge of/background in business (17.4% + 8.7% = 26.1%) Install software and upgrades (17.4% + 8.7% = 26.1%) XML (17.4% + 8.7% = 26.1%) Monitor & manage database(s) & applications (26.1%) Ability to train others (17.4%)

Chart C5. Needed and desired qualifications for Enterprise Systems Integration.

Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> • Ability to work in team environment (42.9% + 5.2% = 48.1%) • Bachelors degree (39.1% + 7.4% = 46.5%) • Good oral communication (33.1% + 9.6% = 42.7%) • Analyze and define system problems (35.3% + 7.4% = 42.7%) • Good written communication (27.1% + 5.2% = 32.3%) • Knowledge of/background in business common practices (25.6% + 7.4% = 33.0%) • Web site analysis OR ESI high-end tech support (20.3% + 11.9% = 32.2%) • Ability to interface with public/customers (26.3% + 4.4% = 30.7%) • Configure, implement, & test enterprise systems (18.8% + 9.6% = 28.4%) • Monitor & manage enterprise systems & applications (20.3% + 8.1% = 28.4%) • Associates degree (25.6%) • Develop systems, solutions & applications (18.8% + 6.7% = 25.5%) • Install software and upgrades (17.3% + 4.4% = 21.7%) • Install, maintain, upgrade computer components (14.3% + 2.2% = 16.5%) • MSCE Certified (11.3% + 4.4% = 15.7%) • Ability train others (12.8% + 1.5% = 14.3%) • Knowledge of /background in math or sciences (11.3% + 3.0% = 14.3%) • Install/Upgrade computer peripherals (11.3% + 2.2% = 13.5%) 	<ul style="list-style-type: none"> • Ability to work in team environment (56.3% + 6.3% = 62.6%) • Good oral communication (50.0% + 12.5% = 62.5%) • Ability to interface with public/customers (34.4% + 12.5% = 46.9%) • Bachelors degree (37.5% + 6.3% = 43.8%) • Knowledge of/background in business common practices (31.3% + 6.3% = 37.6%) • Associates degree (37.5%) • Analyze and define system problems (21.9% + 12.5% = 33.4%) • Install software and upgrades (18.8% + 12.5% = 31.3%) • Web site analysis OR ESI high-end tech support (25.0% + 6.3% = 31.3%) • Monitor & manage enterprise systems & applications (21.9% + 6.3% = 28.2%) • Good written communication (18.8% + 6.3% = 25.1%) • Develop systems, solutions & applications (18.8% + 6.3% = 25.1%) • Configure, implement, & test enterprise systems (12.5% + 12.5% = 25.0%) • Ability train others (18.8%) • Install/Upgrade computer peripherals (12.5% + 6.3% = 18.8%) • Knowledge of /background in math or sciences (15.6%) • Install, maintain, upgrade computer components (12.5%) • Active Server Pages (12.5%) • Microsoft Windows 2000 (12.5%) 	<ul style="list-style-type: none"> • Bachelors degree (51.6% + 25.8% = 77.4%) • Ability to work in team environment (48.4% + 12.9% = 61.3%) • Analyze and define system problems (61.3%) • Configure, implement, & test enterprise systems (41.9% + 6.5% = 48.4%) • Good oral communication (32.3% + 9.7% = 42.0%) • Web site analysis OR ESI high-end tech support (19.4% + 22.6% = 42.0%) • Good written communication (41.91%) • MSCE Certified (22.6% + 12.9% = 35.5%) • Develop systems, solutions & applications (32.3%) • Associates degree (25.8%) • Knowledge of/background in business common practices (12.9% + 12.9% = 25.8%) • Monitor & manage enterprise systems & applications (22.6%) • Install, maintain, upgrade computer components (19.4%) • Diagnose hardware problems (19.4%) • Oracle (19.4%) • Ability to interface with public/customers (16.1% + 3.2% = 19.3%) • Microsoft NT (16.1%) • Install software and upgrades (12.9%) • Microsoft SQL Server (12.9%) • Microsoft Access (12.9%) • SQL (Standard Query Language) (12.9%) 	<ul style="list-style-type: none"> • Bachelors degree (53.0%) • Associates degree (40.0%) • Ability to interface with public/customers (33.3%) • Good written communication (33.3%) • Good oral communication (20.0% + 13.3% = 33.3%) • Monitor & manage enterprise systems & applications (33.3%) • Ability to work in team environment (26.7%) • Ability train others (26.7%) • Install software and upgrades (26.7%) • Microsoft Outlook/Outlook Express (26.7%) • SQL (Standard Query Language) (13.3% + 13.3% = 26.6%) • Cisco CCNA (13.3%) • Network+ Certification (13.3%) • Install/upgrade network components (13.3%) • Novell (13.3%) • C/C++ (13.3%) • Citrix (13.3%) • Java (JavaScript) (13.3%) • Linux (13.3%) • Microsoft Access (13.3%) • Microsoft Excel (13.3%) • Microsoft NT (13.3%) • Microsoft PowerPoint (13.3%) • Microsoft Word (13.3%) • Visual Basic (13.3%) • Design/produce media (13.3%) 	<ul style="list-style-type: none"> • Ability to work in team environment (54.2% + 11.5% = 65.7%) • Good oral communication (37.5% + 19.2% = 56.7%) • Knowledge of/background in business common practices (45.8% + 3.8% = 49.6%^) • Analyze and define system problems (41.7% + 7.7% = 49.4%) • Ability to interface with public/customers (37.5% + 11.5% = 49.0%) • Good written communication (33.3% + 15.4% = 48.7%) • Bachelors degree (33.3% + 15.4% = 48.7%) • Web site analysis OR ESI high-end tech support (25.0% + 23.1% = 48.1%) • Associates degree (33.3%) • Install, maintain, upgrade computer components (29.2% + 3.8% = 33.0%) • Monitor & manage enterprise systems & applications (16.7% + 15.4% = 32.1%) • Install/Upgrade computer peripherals (25.0%) • Install software and upgrades (20.8% + 3.8% = 24.6%) • MSCE Certified (16.7% + 7.7% = 24.4%) • Develop systems, solutions & applications (16.7% + 7.7% = 24.4%) • Configure, implement, & test enterprise systems (16.7% + 7.7% = 24.4%) • Microsoft NT (12.5% + 11.5% = 24.0%) • Diagnose hardware problems (16.7% + 7.7% = 23.4%) • Design network(s) (20.0%) • Knowledge of /background in math or sciences (16.7%) • Active Server Pages (16.7%) • Microsoft SQL Server (Hardware) (12.5% + 3.8% = 16.3%) • Analyze network needs & requirements (13.3%)

Chart C6. Needed and desired qualifications for Software Development or Programming.

Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> Analyze program needs, requirements (41.6% + 10.7% = 52.3%) Bachelors degree (44.1% + 8.2% = 51.3%) Ability to work in team environment (42.9% + 6.3% = 49.2%) Configure, implement & test program(s) & applications (35.9% + 12.6% = 48.5%) Monitor & manage program(s) & applications (28.4% + 13.2% = 41.6%) Design programs, applications (31.5% + 9.5% = 41.0%) Good oral communication (28.4% + 5.7% = 34.1%) Good written communication (29.6% + 3.8% = 33.4%) Knowledge of/background in business common practices (26.5% + 3.8% = 30.3%) Ability to interface with public/customers (25.2% + 2.5% = 27.7%) Associates degree (20.8% + 3.8% = 24.4%) Ability train others (20.8% + 2.5% = 23.3%) Install software and upgrades (15.1% + 5.7% = 20.8%) Java (JavaScript) (14.5% + 2.5% = 17.0%) Visual Basic (13.2% + 2.5% = 15.7%) 	<ul style="list-style-type: none"> Bachelors degree (50.0% + 13.6% = 63.6%) Ability to work in team environment (50.0% + 9.1% = 59.1%) Configure, implement & test program(s) & applications (45.5% + 11.4% = 56.9%) Good oral communication (36.4% + 9.1% = 45.5%) Analyze program needs, requirements (38.6% + 4.5% = 43.1%) Monitor & manage program(s) & applications (29.5% + 13.6% = 43.1%) Design programs, applications (34.1% + 6.8% = 40.9%) Knowledge of/background in business common practices (29.5% + 9.1% = 38.6%) Ability to interface with public/customers (25.0% + 4.5% = 29.5%) Good written communication (22.7% + 4.5% = 27.2%) Ability train others (22.7%) Associates degree (15.9%) Install software and upgrades (13.6% + 4.5% = 18.1%) Masters Degree (11.4%) 	<ul style="list-style-type: none"> Bachelors degree (55.9% + 17.6% = 73.5%) Analyze program needs, requirements (55.9% + 11.8% = 67.7%) Ability to work in team environment (41.2% + 5.9% = 47.1%) Good written communication (35.3% + 5.9% = 41.2%) Configure, implement & test program(s) & applications (29.4% + 11.8% = 41.2%) Monitor & manage program(s) & applications (20.6% + 17.6% = 38.2%) Design programs, applications (23.5% + 11.8% = 35.3%) Good oral communication (17.6% + 8.8% = 26.4%) Associates degree (23.5%) Ability to interface with public/customers (23.5%) SQL (Standard Query Language) (14.7% + 8.8% = 23.5%) Java (JavaScript) (14.7% + 5.9% = 20.6%) Visual Basic (14.7% + 5.9% = 20.6%) Microsoft Windows 2000 (17.6% + 2.9% = 20.5%) Cobol (11.8% + 5.9% = 17.7%) Microsoft Access (11.8% + 5.9% = 17.7%) Knowledge of/background in business common practices (17.6%) Active Server Pages (14.7%) Microsoft SQL Server (Software) (14.7%) HTML (11.8%) Oracle (11.8%) Perl (11.8%) 	<ul style="list-style-type: none"> Monitor & manage program(s) & applications (21.7% + 26.1% = 47.8%) Bachelors degree (39.1% + 8.7% = 47.8%) Ability to work in team environment (47.8%) Good oral communication (43.5%) HTML (30.4% + 8.7% = 39.4%) Java (JavaScript) (39.1%) Analyze program needs, requirements (30.4% + 8.7% = 39.1%) Configure, implement & test program(s) & applications (26.1% + 13.0% = 39.1%) Associates degree (34.8%) Design programs, applications (17.4% + 13.0% = 30.4%) Visual Basic (26.1%) Ability to interface with public/customers (21.7%) Knowledge of/background in business common practices (21.7%) Good written communication (21.7%) C/C++ (21.7%) Ability train others (17.4%) Microsoft Access (17.4%) Microsoft Excel (17.4%) XML (13.0%) 	<ul style="list-style-type: none"> Analyze program needs, requirements (50.0% + 14.3% = 64.3%) Bachelors degree (35.7% + 14.3% = 50.0%) Design programs, applications (42.9% + 7.1% = 50.0%) Good written communication (39.3% + 7.1% = 46.4%) Knowledge of/background in business common practices (42.9%) Monitor & manage program(s) & applications (14.3% + 28.6% = 42.9%) Ability to interface with public/customers (35.7% + 7.1% = 42.8%) Configure, implement & test program(s) & applications (32.1% + 7.1% = 39.2%) Good oral communication (21.4% + 14.3% = 35.7%) Ability to work in team environment (28.6% + 7.1% = 35.7%) Associates degree (21.4% + 7.1% = 28.5%) Active Servers Pages – software (25.0%) Install software and upgrades (21.4%) Install, maintain, repair, upgrade computer components (21.4%) Microsoft SQL Server (Software) (21.4%) Microsoft Windows 2000 (21.4%) Java (JavaScript) (10.7% + 7.1% = 17.8%) Knowledge of /background in math or sciences (14.3%) Active Server Pages – hardware (14.3%) XML (14.3%)

Chart C6. Needed and desired qualifications for Software Development or Programming.				
Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
		<ul style="list-style-type: none"> A+ Certification (11.4%) 		

Chart C7. Needed and desired qualifications for Digital Media & Desktop Publishing.				
Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> • Good oral communication (37.6% + 5.5% = 43.1%) • Ability to work in team environment (41.4%) • Design/produce media (24.4% + 10.8% = 35.2%) • Bachelors degree (29.8% + 3.7% = 33.5%) • Ability to interface with public/customers (28.2% + 4.6% = 32.8%) • Configure, implement & test media (24.4% + 7.4% = 31.8%) • Associates degree (30.1% + 1.5% = 31.6%) • Monitor & manage digital media production (25.4% + 5.5% = 30.9%) • Analyze project needs and requirements (26.3% + 3.7% = 30.0%) • Good written communication (28.2%) • Ability train others (17.9%) • Knowledge of/background in business common practices (15.0% + 1.8% = 16.8%) • Install software upgrades (12.2%) • Microsoft Windows 2000 (10.3%) 	<ul style="list-style-type: none"> • Ability to work in team environment (48.0%) • Associates degree (40.0%) • Good oral communication (40.0%) • Ability to interface with public/customers (32.0%) • Good written communication (24.0%) • Microsoft Windows 2000 (16.0% + 8.0% = 24.0%) • Analyze project needs and requirements (24.0%) • Design/produce media (24.0%) • Configure, implement & test media (24.0%) • Monitor & manage digital media production (24.0%) • Ability train others (16.0%) • Bachelors degree (16.0%) • Install software upgrades (16.0%) 	<ul style="list-style-type: none"> • Ability to work in team environment (60.0%) • Analyze project needs and requirements (55.0%) • Ability to interface with public/customers (40.0% + 13.6% = 53.6%) • Bachelors degree (35.0% + 18.2% = 53.2%) • Configure, implement & test media (40.0% + 9.1% = 49.1%) • Good oral communication (40.0% + 9.1% = 49.1%) • Associates degree (45.0%) • Monitor & manage digital media production (35.0% + 9.1% = 44.1%) • Design/produce media (25.0% + 18.2% = 43.2%) • Knowledge of/background in business common practices (30.0%) • SQL (Standard Query Language) (20.0%) • Microsoft Outlook/Outlook Express (10.0% + 9.1% = 19.1%) • Microsoft Word (10.0% + 9.1% = 19.1%) • Email network administration (10.0% + 9.1% = 19.1%) • Java (JavaScript) (15.0%) • C/C++ (10.0%) • HTML (10.0%) • Microsoft Access (10.0%) • Microsoft Excel (10.0%) • Visual Basic (10.0%) • Monitor & manage network(s) (10.0%) • Web site analysis OR ESI high-end tech support (10.0%) • Design web site(s) & applications (10.0%) • Design/produce documents (15.0%) • High school diploma (10.0%) • Good written communication (10.0%) • Ability train others (10.0%) 	<ul style="list-style-type: none"> • Bachelors degree (42.9% + 14.3% = 57.2%) • Associates degree (42.9%) • Ability to work in team environment (28.6%) • Monitor & manage digital media production (28.6%) • Microsoft Word (28.6%) • Design/produce media (28.6%) • Microsoft Excel (28.6%) • Microsoft SQL Server (14.3%) • Microsoft Window 2000 (14.3%) • SQL (Standard Query Language) (14.3%) • Visual Basic (14.3%) • Design database(s) & applications (14.3%) • Monitor & manage network(s) (14.3%) • Design web site(s) & applications (14.3%) • Analyze project needs and requirements (14.3%) • Configure, implement & test media (14.3%) • Ability train others (14.3%) • Ability to interface with public/customers (14.3%) • Good written communication (14.3%) • Good oral communication (14.3%) • Knowledge of/background in business common practices (14.3%) • Install software upgrades (14.3%) • Install/upgrade computer peripherals (14.3%) • C/C++ (14.3%) • HTML (14.3%) • Java (JavaScript) (14.3%) • Microsoft Access (14.3%) • Microsoft Outlook/Outlook Express (14.3%) 	<ul style="list-style-type: none"> • Ability to interface with public/customers (66.7% + 14.3% = 81.0%) • Good oral communication (58.3% + 14.3% = 72.6%) • Design/produce media (25.0% + 14.3% = 39.3%) • Ability train others (33.3%) • Knowledge of/background in business common practices (33.3%) • Install software upgrades (33.3%) • Install, maintain, repair, upgrade computer components (33.3%) • Microsoft Windows 2000 (33.3%) • Ability to work in team environment (25.0%) • Configure, implement & test media (25.0%) • Good written communication (25.0%) • Oracle (25.0%) • Personal support for customers experiencing hardware problems (16.7%) • Active Server Pages (16.7%) • High school diploma (16.7%) • Associates degree (16.7%) • A+ Certification (16.7%) • MSCE Certified (16.7%) • Network+ Certification (16.7%) • Perl (16.7%) • SQL (Standard Query Language) (16.7%) • Configure, implement & test network(s) (16.7%) • Design web site(s) & applications (16.7%) • Update/maintain web site(s) & applications (16.7%) • Configure, implement & test program(s) & applications (16.7%) • Analyze project needs and requirements (16.7%) • Monitor & manage digital media production (16.7%) • Design/produce documents (16.7%)

Chart C8. Needed and desired qualifications for Technical Writing.

Overall	Number of IT workers		Percent of employees in IT jobs	
	10 to 19	20+	21%-75%	76%
<ul style="list-style-type: none"> • Design/produce documents (36.9% + 3.5% = 40.4%) • Good written communication (34.6% + 2.3 = 36.9%) • Bachelors degree (33.5%) • Ability to work in team environment (32.3%) • Monitor & manage technical writing production (20.8% + 10.4% = 31.2%) • Analyze project needs and requirements (Tech Writing) (27.7% + 2.3% = 30.0%) • Good oral communication (23.1% + 2.3% = 25.4%) • Associates degree (24.2%) • Knowledge of/background in business common practices (21.9%) • Ability to interface with public/customers (19.6%) • Ability train others (15.0%) 	<ul style="list-style-type: none"> • Good oral communication (43.8%) • Ability to work in team environment (37.5%) • communication (31.3%) • Associates degree (25.0%) • Ability train others (25.0%) • Analyze project needs and requirements (Tech Writing) (25.0%) • Design/produce documents (25.0%) • Monitor & manage technical writing production (25.0%) • Ability to interface with public/customers (18.8%) • Good written Knowledge of/background in business common practices (18.8%) • Bachelors degree (12.5%) • Masters degree (12.5%) • Active Server Pages (12.5%) 	<ul style="list-style-type: none"> • Good written communication (52.2% + 8.7% = 60.9%) • Design/produce documents (47.8%) • Analyze project needs and requirements (Tech Writing) (43.5%) • Bachelors degree (39.1%) • Monitor & manage technical writing production (21.7% + 17.4% = 39.1%) • Associates degree (34.8%) • Ability to work in team environment (30.4%) • Ability to interface with public/customers (30.4%) • Good oral communication (21.7% + 8.7% = 30.4%) • Knowledge of/background in business common practices (26.1%) • MCSE Certified (13.0%) 	<ul style="list-style-type: none"> • Good written communication (47.4%) • Bachelors degree (42.1%) • Ability to work in team environment (42.1%) • Good oral communication (36.8%) • Associates degree (31.6%) • Ability train others (31.6%) • Analyze project needs and requirements (Tech Writing) (31.6%) • Design/produce documents (31.6%) • Monitor & manage technical writing production (10.5% + 21.1% = 31.6%) • Ability to interface with public/customers (26.3%) • Knowledge of/background in math or sciences (15.8% + 10.5% = 26.3%) • High school diploma (10.5%) • Install/upgrade computer peripherals (10.5%) • Novell (10.5%) • HTML (10.5%) • Microsoft Access (10.5%) • Microsoft Excel (10.5%) • Design/produce media (10.5%) 	<ul style="list-style-type: none"> • Good written communication (36.4% + 18.2% = 54.6%) • MCSE Certified (36.4%) • Microsoft SQL Server – hardware (18.2% + 18.2% = 36.4%) • Java (JavaScript) (36.4%) • Associates degree (18.2%) • Bachelors degree (18.2%) • Ability to interface with public/customers (18.2%) • Knowledge of/background in business common practices (18.2%) • Diagnose hardware problems (18.2%) • Phone, email support for customers with hardware problems (18.2%) • Personal support for customers with software problems (18.2%) • Design/produce documents (18.2%) • Monitor & manage technical writing production (18.2%)

Figure 3a. Position in organization.
(Includes all respondents)

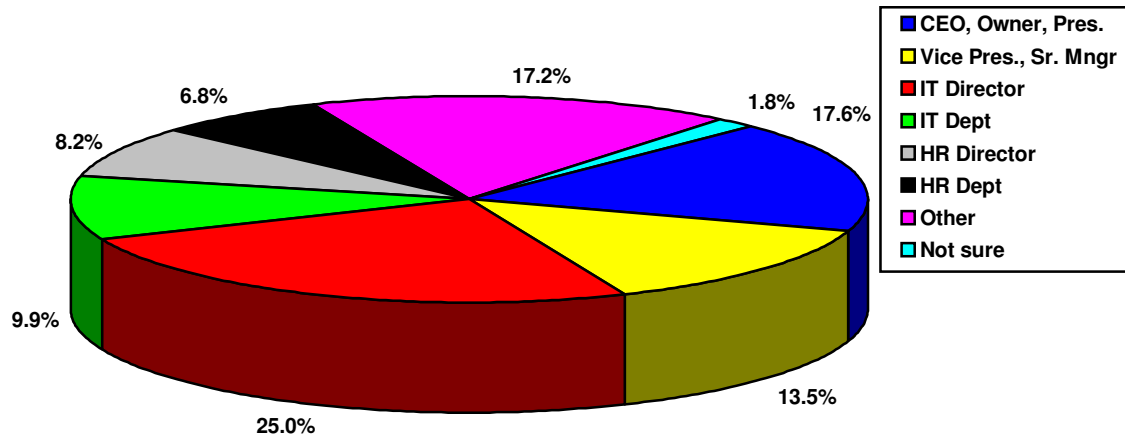


Figure 3b. Personal involvement in hiring IT workers for organization.
(Includes all respondents)

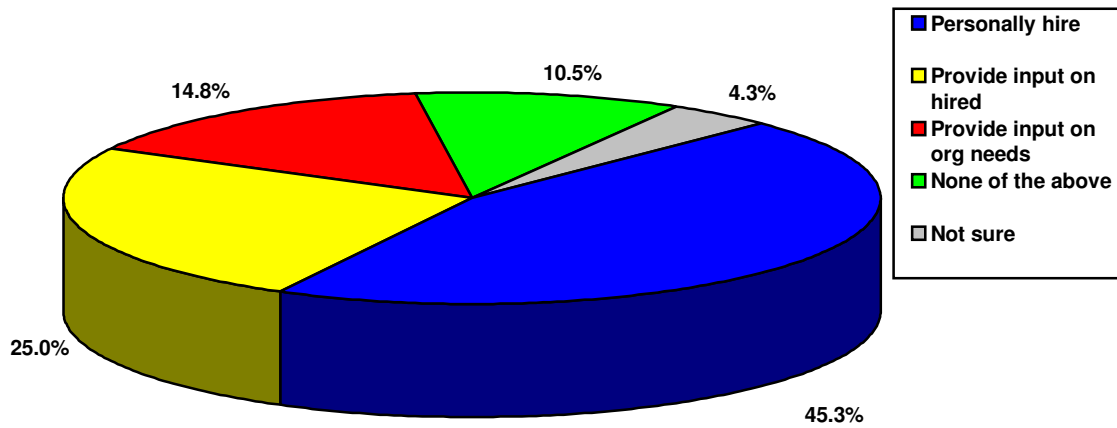


Figure 3c. The total amount your organization has budgeted for IT education and training for you 2002 fiscal year.
(Includes all respondents)

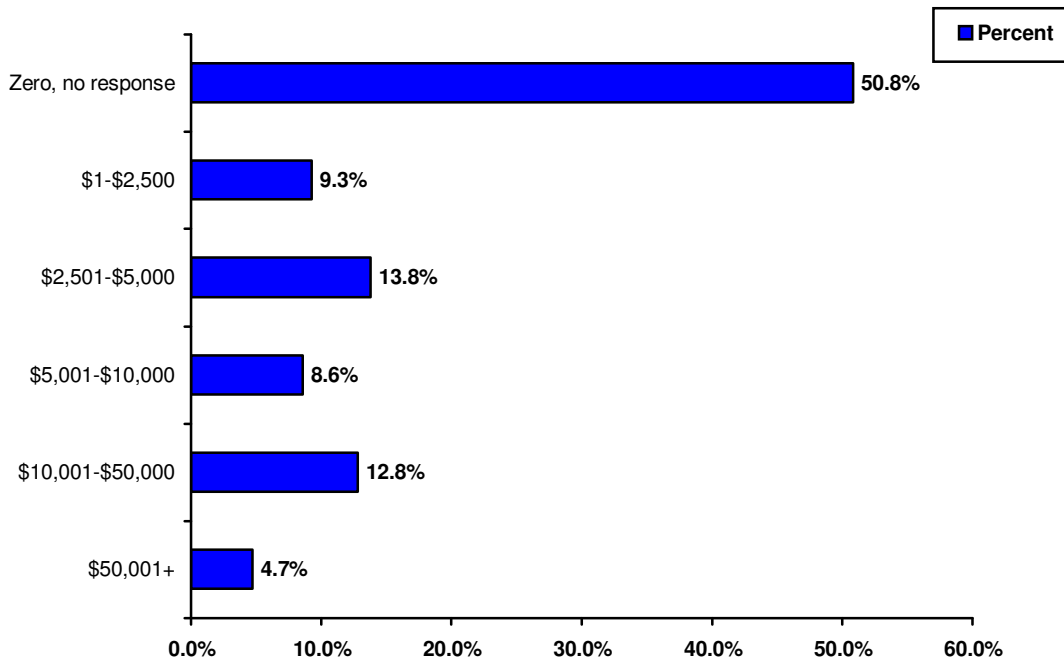
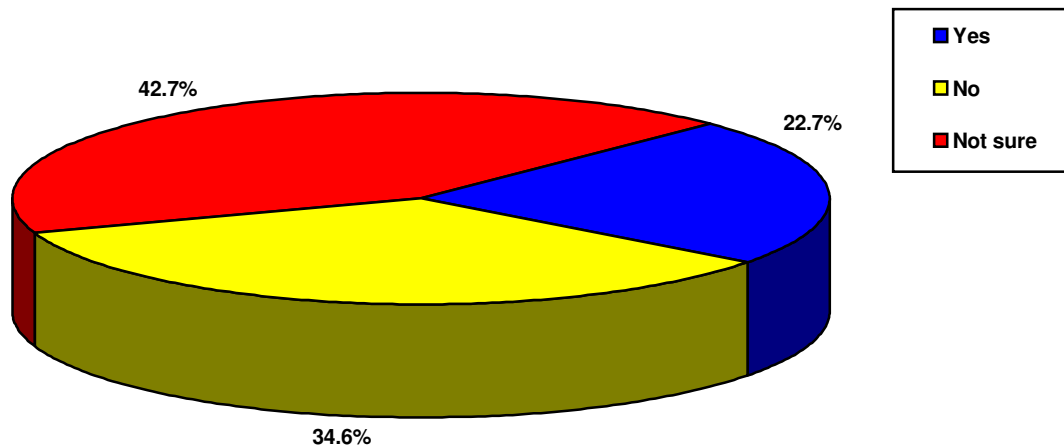


Figure 3d. Willing to share copies of any written job descriptions for IT positions you currently employ and/or are likely to hire in the next 12 months.
(Includes all respondents)



Section

4

THE QUESTIONNAIRE

The following questionnaire was designed with assistance from IT Needs Assessment Steering Committee, which included the following:

- James J. Hirsch, Department of Commerce
- Maren L. Daley, Job Service North Dakota
- Larry A. Isaak, North Dakota University System
- Wayne L. Kutzer, Vocational & Technical Education
- Max Laird, North Dakota Workforce Development Council
- Al Lukes, Dakota Gasification Company
- Curtis L. Wolfe, Information Technology Department
- Kyle Davison, Skills & Technology Training Center
- Nelse Grundvig, Job Service North Dakota

Either a mail or web version of the questionnaire in this report was used for all interviews conducted for this study.

Section 5

CONTINGENCY TABLES

Contingency tables are commonly referred to as “cross-tabs”. They present the findings in an easy-to-understand, table form and provide the categorical data that is used most frequently in marketing. We strongly recommend that you review these tables and use them to facilitate any major decisions you make.

The contingency tables on the following pages show the proportion of all respondents who gave various responses to each question, as well as the proportion of specific sample segments (i.e. total number of employees, number of IT employees, proportion of IT employees, etc.) who provided a particular response. This detail will enable you to determine which segments are more likely (or less likely) to have certain habits, intentions, and/or opinions.

Please note the tables are separated into sections. The tables in each section have the same “banners” or sample segments across the top. Within each section, the tables are in order by question number, which appears on the top, left-hand side of each table.